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(54) Keying system for ink supply containers

(57) The present invention is an ink container (12) for supplying ink having proper ink parameters to an ink supply station (40). The ink container (12) includes a latch feature (22, 22') indicative of an ink parameter of

a plurality of ink parameters. The latch feature (22, 22') being configured for engaging a supply station (40) latch surface (46) for securely mounting ink containers (12) having proper ink parameters in supply stations (40).

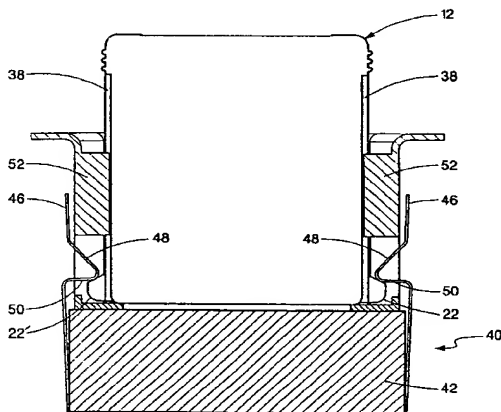


FIG. 3

Description

Cross Reference To Related Applications

This application is a continuation-in-part of Patent Application serial number 08/566,521 filed December 4, 1995 entitled "*Keying System For Ink Supply Containers*" assigned to the assignee of the present invention, incorporated herein by reference (European Patent Application 96306871.3).

BACKGROUND OF THE INVENTION

The present invention relates to replaceable ink supply containers for providing ink to ink jet printers. More specifically, the present invention relates to a system which makes use of integrated keying, latching and aligning features on the ink container for insuring the correct ink supply container is properly oriented and properly located when inserted into an ink jet printer and that the ink supply container is properly secured to the printer.

Ink jet printers frequently make use of an ink jet printhead mounted to a carriage which is moved back and forth across a print media, such as paper. As the printhead is moved across the print media, a control system activates the printhead to eject, or jet, ink droplets onto the print media to form images and characters.

One type of ink jet printer previously used makes use of a replaceable ink cartridge. The ink cartridge includes a printhead and an ink supply. When the ink cartridge is out of ink or a different type of ink is required for a particular print media the entire ink cartridge is replaced. Therefore, only the replacement ink cartridge need be compatible with the particular printer in which the cartridge is to be inserted.

Alternatively, the ink jet printhead and the ink supply can each be separately replaced as discussed in Patent Application serial number 08/566,521. For this type of ink jet printer the ink supply is spaced from the printhead. The printhead is mounted to the carriage and ink is provided to the printhead by way of a flexible fluid interconnect between the ink supply and the printhead. For this type of arrangement, the ink supply container can be replaced without replacing the printhead.

It is crucial that inks having different ink parameters, such as ink color and ink family, be prevented from interacting in a manner which can reduce the quality of the output image. For example, inks of different colors must not be intermixed. In addition, inks from different ink families must not be intermixed.

In the case of color ink jet printers a plurality of ink colors are used to create images and characters on the print media. These printers usually require a separate ink supply container for each color, for example, black, cyan, yellow, and magenta in the case of four color printing. Frequently a plurality of printheads are used with each printhead dedicated to a particular color. However,

a single printhead may be used with different portions thereof being dedicated to each color. Separate ink delivery systems such as fluid interconnects between the ink supplies and printheads are provided for each color.

In addition to color, a variety of printers make use of different classes or families of ink for different kinds of printing applications or print media. For example, many home or office printing applications use aqueous based inks. Some applications require inks which are water fast which are typically non aqueous based inks. Another type of ink is used to provide images that are resistant to ultraviolet light which typically causes fading of aqueous based inks. Therefore, there are a wide variety of different ink families for a given ink color. These families are generally not compatible with each other.

It is generally not a problem keeping inks of different colors and different ink families separated in printers that make use of replaceable cartridges having an integrated printhead and ink storage container. Because the entire ink supply, printhead and ink conduit between the ink supply and printhead are replaced with the ink cartridge there is generally not a concern of ink of different colors or families from mixing. In contrast, there is little opportunity for inks of different ink families or different ink colors to become intermixed in printers which make use of ink storage units that are replaceable separately from the printhead. Replacing the ink storage unit with an ink color or ink family that is different from the previous ink storage unit results in the mixing of ink from the replacement ink storage unit with ink remaining in the printhead and ink conduit from the previous ink storage unit. This intermixing of ink colors tends to produce unpredictable colors reducing the quality of output images. In addition, the mixing of ink families can result in chemical interactions between the residual ink and replacement ink which can result in a precipitate which can block the ink passages or result in unpredictable performance of the printhead.

There is an ever present need for systems for insuring that ink containers having the proper ink parameters are correctly inserted into the ink jet printer. These systems should insure that the ink container is properly aligned so that proper fluid interconnect is provided between the ink container and the printhead. In addition, this system should provide some form of tactile feedback so that the user knows that the ink container is properly inserted into the printer. And finally, this system should provide some means for securing the ink container in the ink jet printer so that the ink container does not inadvertently become disconnected thereby causing ink spillage. This system should be cost effective and easily manufactured.

SUMMARY OF THE INVENTION

The present invention is an ink container for supplying ink having proper ink parameters to an ink container receiving station. The ink container includes a latch fea-

ture indicative of an ink parameter of a plurality of ink parameters. The latch feature is configured for engaging ink container receiving station latch surfaces, for securely mounting ink containers having proper ink parameters to the ink container receiving station.

In one preferred embodiment the latch feature is a first and second latch feature. The first latch feature is indicative of ink color associated with the ink container and the second latch feature is indicative of ink family associated with the ink container. In this preferred embodiment the first latch feature is a first plurality of tabs and the second latch feature is a second plurality of tabs, spaced from the first plurality of tabs.

Another aspect of the present invention is an ink container receiving station for receiving ink containers having proper ink parameters. The ink container receiving station includes a latching mechanism configured for engaging corresponding ink container latching features and securing ink containers to the supply station. The ink container receiving station includes a keying system component to define, in conjunction with ink container latch features, ink containers having proper ink parameters.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of an ink supply container which includes the latch features of the present invention which are indicative of ink parameters.

FIG. 2 is a perspective view of an ink container receiving station for receiving the ink container shown in FIG. 1.

FIG. 3 is the ink container of the present invention shown in engagement with the ink container receiving station of the present invention shown in partial cross section.

FIGS. 4A - 4G are bottom views of ink containers showing various latching and keying components of a preferred embodiment of the keying system of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows an ink container 12 of the present invention for use with an ink jet printer having an ink jet printhead (not shown). The ink container 12 of the present invention is configured for insertion into an ink container receiving station mounted on the printer for ensuring ink containers having compatible ink parameters are properly inserted into the printer and properly secured to the printer. The ink container receiving station will be discussed in more detail with respect to FIG. 2.

The ink container 12 includes housing members 14 and 16, an ink bag 18, and a fitment 20 for providing a fluid interconnect between the ink bag 18 and the printer (not shown). Also included in the ink container 12 are

latch features 22 and 22' which are the subject of this invention. Latch features 22 and 22' in conjunction with corresponding latch surfaces, as will be discussed with respect to FIG. 2, secure the ink container 12 to the printer. In addition, the latch features 22 and 22' provide keying features to prevent the insertion of ink containers having incompatible ink parameters. Finally, the latch features aid in the guiding and aligning of ink containers during the insertion of the ink containers into the ink container receiving station on the printer.

One aspect of latch features 22 and 22' of the present invention are to identify ink parameters of ink within the ink container 12. The latch features 22 and 22' are capable of identifying a large number of different ink parameters. These ink parameters include ink color and ink family, to name a few. The ink family is indicative of the chemical and physical properties of the ink formulation within the ink container 12. Ink formulations specify such ink parameters as solubility in water, waterfastness of the ink, ultraviolet stability of the ink etc. It is crucial that only ink containers having compatible ink parameters be installed in the printer. If incompatible ink containers are installed then the ink in the container will combine with residual ink in the printhead resulting in a degradation in the output image quality.

The latch features 22 and 22' in addition to identifying ink parameters also provide guiding and aligning features for inserting the ink container 12 into the ink container receiving station on the ink jet printer. The guiding and aligning features allow the user to insert the ink container 12 to make fluid connection with the printer without having to visually align the fluid interconnects. The user, therefore, need only insert the ink container 12, and if it is compatible, then the latch features 22 and 22' of the present invention will allow the ink container 12 to be inserted. During insertion, the latch features 22 and 22' align and guide the ink container 12 into the printer. An important aspect of the present invention is that the latch features 22 and 22' align the container 12 such that a fluid interconnection is made between the ink container 12 and the printer.

Another aspect of the present invention is that the latch features 22 and 22' are used to secure the ink container 12 to the printer. The latch features 22 and 22' together with latch surfaces located on the printer secure the ink container 12 to the printer. The latch surfaces will be discussed later with respect to FIG. 2.

In the preferred embodiment the ink container 12 is made from identical housing members 14 and 16. Use of identical housing members make it possible to form each of the housing members 14 and 16 using a single mold. The housing members are assembled as mirror images of each other. The use of a single mold for forming both of the housing members 14 and 16 reduces manufacturing costs as well as parts count. A reduction in parts count reduces costs associated with stocking and tracking of parts.

In this preferred embodiment housing member 16

includes fastening features 26 and 28 which interact with retaining features 30 and 32 on housing members 14 thereby forming a snap fastening of the housing members 14 and 16. Because housing members 14 and 16 are mirror images of each other, housing member 14 also includes fastening features 26 and 28 (not shown) similar to housing member 16. The fastening features of housing member 14 engage retaining features 30 and 32 on housing member 16 to fasten housing members 14 and 16 together. The use of fastening features 26 and 28 and retaining features 30 and 32 allow the fastening of housing members together without requiring additional parts thereby reducing manufacturing costs. In addition, the use of snap together housing members 14 and 16 allows the ink container 12 to be assembled relatively easily thereby reducing manufacturing cost.

Alternatively, the housing members 14 and 16 may be fastened using a wide variety of conventional fastening techniques such as bonding using an adhesive, one of a variety of welding techniques or fastening with a fastener such as a clip or screw.

In the preferred embodiment, the fitment 20 is attached to the ink bag in a conventional manner and the fitment 20 is secured in a fitment receiving portion 34 between the housing members 14 and 16. The fitment 20 includes a fluid interconnect portion 36 which includes a septum and a ball valve. The fluid interconnect portion 36 interacts with a corresponding fluid interconnect portion on the printer for providing a fluid interconnect between the ink container 12 and the printer. In the preferred embodiment the fluid interconnect portion of the printer includes a needle portion which pierces the septum and opens the ball valve as the ink container 12 is inserted into the printer using latch members 22 and 22'. Latch members 22 and 22' guide the ink container to align the fluid interconnect portions of each of the ink container 12 and the printer. Alternatively, the fluid interconnect may be a conventional fluid interconnect which provides a reliable fluid interconnect.

In another embodiment, the ink container 12 contains a frame having a flexible sheet attached to the frame such as disclosed in serial number 08/566,521. Alternatively, the ink container 12 may be formed without an ink bag 18 inside. For this alternative embodiment the housing members 14 and 16 can be either formed separately and hermetically sealed together to form the ink container 12 or the housing members 14 and 16 can be molded as a unitary member to form the ink container 12. In each of these embodiments, the housing members 14 and 16 form a hermetic seal or are a unitary member allowing ink to be placed directly in the housing members 14 and 16.

FIG. 2 shows an ink container receiving station 40 for receiving the ink container 12 of the present invention. The ink container receiving station 40 is attached to the ink jet printer and is used in conjunction with the latch features 22 and 22' on the ink container 12 to insure ink containers 12 having the proper ink parameters

are inserted into the printer. In addition, the ink container receiving station 40 together with the latch features 22 and 22' guide the ink container 12 during insertion into the printer to ensure the ink container fluid interconnect 36 properly aligns with the printer fluid interconnect. The ink container receiving station 40 includes a base 42 that is mounted to an ink jet printer 44. The receiving station 40 also includes latch members 46 for engaging the latch features 22 and 22' for securing the ink container 12 to the base 42.

FIG. 3 shows the ink container 12 properly positioned in the ink container receiving station 40 such that latch members 46 engage each of the latch features 22 and 22' to securely hold the ink container 12 in position in the ink container receiving station 40. The ink container receiving station 40 together with the latch features 22 and 22' guide the ink container 12 during insertion into the printer to mechanically align the ink container 12 with the latch members 46 for securing the ink container 12 to the printer. The latch features 22 and 22' and the ink container receiving station 40 also provide a guiding and aligning function for ensuring proper electrical interconnection between the ink container 12 and the printer. This electrical interconnect allows the exchange of a variety of information between the ink container 12 and printer such as ink level information provided by an electrical sensor or additional ink parameter or ink container 12 information that is stored in a storage device associated with the ink container 12.

In the preferred embodiment the latch members 46 are spring clips which are shaped to engage each of the latch features 22 and 22' to hold the ink container 12 in position on the ink receiving station 40. The latch members 46 have a non-latching position and a latching position. During insertion of the ink container 12, a non-latching surface 48 of the latch members 46 are urged by the latch features 22 and 22' into a non-latching position allowing the insertion of ink container 12. Once the ink container 12 is properly positioned in the ink container receiving station 40, as shown in FIG. 3, the latch members 46 spring back into a latching position whereupon a latching surface 50 of the latch members 46 engages the latch features 22 and 22' to secure the ink container 12 to the ink receiving station 40.

Tactile feedback is provided to the user as the ink container 12 is inserted into the ink receiving station 40 identifying the ink container 12 is properly positioned. Tactile feedback is provided by both the configuration of the latch members 46 as well as the configuration of the latch features 22 and 22'. As the ink container 12 is inserted, the latch members 46 provide a slight resistance as the non-engagement surfaces 48 engage the latch members 46 and urge the latch members 46 into the non-engagement position. Once the ink container 12 is properly positioned in the ink container receiving station 40, the engagement surfaces 50 engage the latch features 22 and 22' urging the ink container 12 towards the ink container receiving station 40 thereby providing tac-

tile feedback to the user.

A pair of flanges 52 are formed on either side of the ink container receiving station 40. The pair of flanges 52 are configured to engage slots 38 which are defined in sidewalls of the ink container 12 to aid in guiding and aligning the ink container 12 during insertion into the ink container receiving station 40.

FIGS. 4A - G show ink containers 12A, 12B, 12C, 12D, 12E, 12F, and 12G each positioned within corresponding ink container receiving stations 40A, 40B, 40C, 40D, 40E, 40F, and 40G, respectively. Similar numbering is used in FIGS. 4A-G to represent features of FIGS. 1-3 that are similar. Each of the ink containers 12A-G have a unique arrangement of latch features 22A-G, and 22'A-G, respectively, which are indicia of different ink parameters of ink contained within each of the ink containers 12A-G. Each of the ink container receiving stations 40A-G include corresponding latch feature slots 54A-G which correspond to latch features 22A-G, respectively, and latch feature slots 56A-G which correspond to latch features 22'A-G, respectively.

The latch features 22A-G and 22'A-G together with corresponding latch feature slots 54A-G and 56A-G cooperate to ensure proper ink containers 12A-G are properly positioned in the ink container receiving station 40A-G. The ink containers 12A-G can only be inserted into ink container receiving stations 40A-G having corresponding latch feature slots 54A-G and 56A-G that are configured for that particular ink parameter. For example, the latch feature receiving slots 54B and 56B are configured to receive ink container 12B having ink parameters which are compatible. Ink containers 12A,C,D,E,F,G containing inks having non-compatible ink parameters cannot be inserted into the ink container receiving station 40B because the latch feature slots 54B and 56B do not correspond to the latch features 22A,C,D,E,F,G and 22'A,C,D,E,F,G.

In addition, the latch features 22A-G and 22'A-G together with corresponding latch feature slots 54A-G and 56A-G provide guiding and aligning features to ensure that the fluid interconnect 36 of the ink container 12 is properly aligned with the corresponding fluid interconnect on the printer. The fluid interconnect is mounted to the ink container 12A-G by the filament receiving portion 34A-G, respectively.

An important feature of the latch features 22A,C,D,E,F,G and 22'A,C,D,E,F,G of the present invention is that in addition to the keying, guiding and aligning features previously discussed, these latch features are used in conjunction with the latch members 46 to secure the ink container 12 to the ink container receiving station 40.

In the preferred embodiment the latch features 22 and 22' are projecting tabs or keys which are evenly spaced. Each ink container 12 is initially manufactured to have an equal number of tabs or keys. The ink container 12 is then identified as having particular ink parameters by selectively removing tabs or keys to repre-

sent ink parameters contained therein. Alternatively, the ink containers may be initially formed having only the latch features or tabs required for the particular ink composition. By forming ink containers 12 to identify the ink parameter contained therein the step of selectively removing tabs or keys is eliminated.

The latch features 22 and 22' may be arranged in other locations on the ink container provided a suitable latching mechanism is provided on the ink container receiving station 40 to engage these latch features. It is preferable the latch features be toward a leading edge of the ink container 12 as the container is inserted into the receiving station 40 to provide guiding and alignment of the container 12 and also prevent the container from insertion to the extent that fluid connection is made prior to the keying function.

In conclusion, the present invention provides an ink container having a single set of features which perform latching, keying and aligning functions during the insertion of the ink container into an ink container receiving station. Integrating each of these functions into a single set of features reduces the complexity of molds used to form the ink container which reduces the manufacturing costs. In addition, the reduction of the latching, keying, and aligning features to a single integrated feature set tends to produce a cleaner more aesthetically pleasing container.

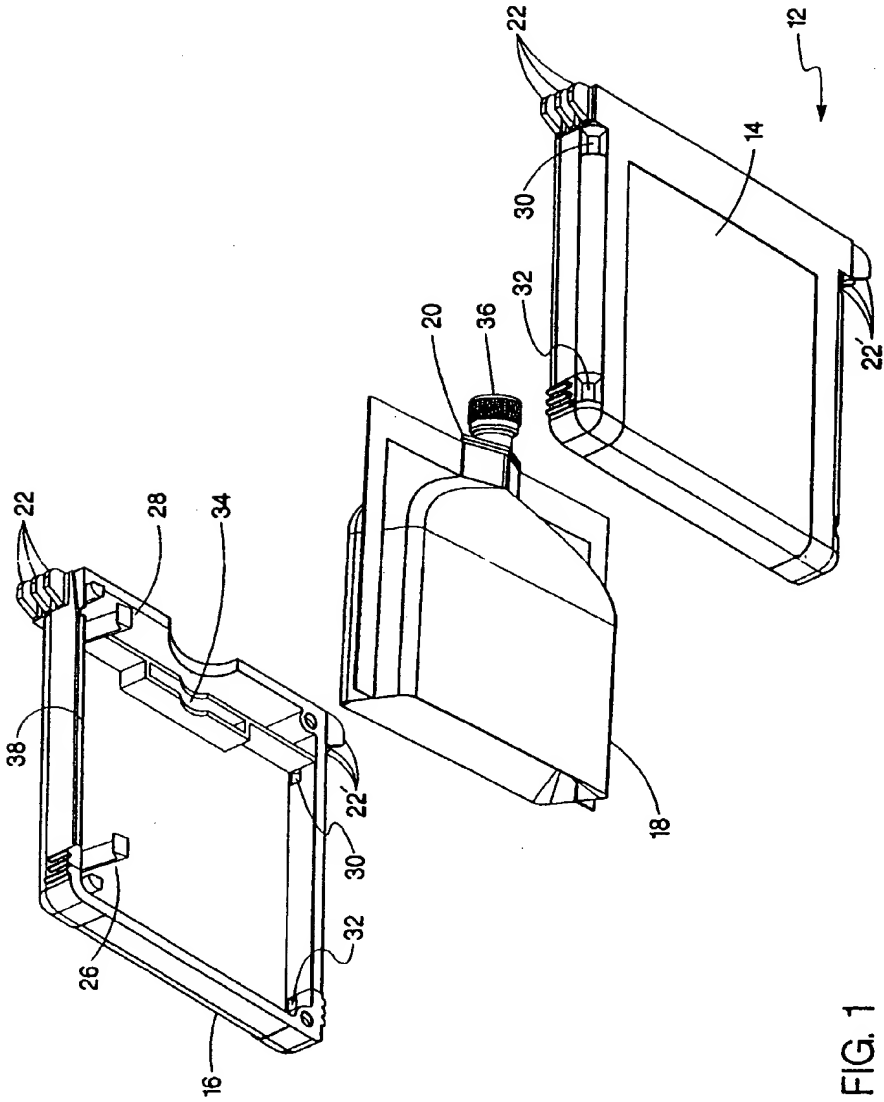
Claims

1. An ink container (12) for supplying ink having proper ink parameters to an ink container receiving station (40), the ink container (12) comprising:
 - a latch feature (22, 22') indicative of an ink parameter of a plurality of ink parameters the latch feature (22, 22') being configured for engaging ink container receiving station latch surfaces (50) for securely mounting ink containers (12) having proper ink parameters.
2. The ink container (12) of claim 1 wherein the latch feature (22, 22') is a first and second latch feature and wherein the ink container receiving station latch surface (50) is a first and second latch surface with the first latch feature (22) indicative of a first ink parameter and configured for engaging the first latch surface (50) and the second latch feature (22') indicative of a second ink parameter and configured for engaging the second latch surface (50).
3. The ink container (12) of claim 2 wherein the first latch feature (22) is different from the second latch feature (22').
4. The ink container (12) of claim 2 wherein one of the first and second latch features (22, 22') are indicative of ink color associated with the ink container

(12).

to keying components (54A-G, 56A-G) to the ink based printing device.

5. The ink container (12) of claim 2 wherein one of the first and second latch features (22, 22') are indicative of ink compatibility associated with the ink container (12). 5
6. The ink container (12) of claim 2 wherein the first latch feature (22) is indicative of an ink color associated with the ink container (12) and the second latching feature (22') is indicative of an ink family associated with the ink container (12). 10
7. The ink container (12) of claim 2 wherein each of the first and second latch features (22, 22') are a plurality of tabs extending from the ink container (12). 15
8. The ink (12) of claim 2 further including an ink container receiving station (40), the ink container receiving station (40) including: 20
 - a first latching member (46) configured for engaging corresponding ink container (12) first latch features (22); 25
 - a second latching member (46) configured for engaging corresponding ink container (12) second latch features (22'); and
 - a keying system component (56A-g, 54A-G) attached to the ink container receiving station (40) to define, in conjunction with latch features (22, 22') ink containers (12) having proper ink parameters. 30
9. The ink container (12) of claim 8 wherein the ink container receiving station (40) is attached to an ink jet printer and ink provided by the ink container (12) is utilized by the ink jet printer to form images on media. 35
10. A system for locating an ink container (12) in an ink based printing device, the system comprising: 40
 - a plurality of ink containers (12), each of the plurality of ink containers having a plurality of latching features (22, 22') indicative of an ink parameter; 45
 - a keying component (54A-G, 56A-G) integrated into the ink based printing device to guide the insertion of ink containers (12) having corresponding latching features (22, 22') and restricts the insertion of ink containers (12) having latching features (22, 22') which corresponding to non-compatible ink parameters; 50
 - and 55
 - a latching mechanism (46) configured for engaging the plurality of latching features (22, 22') for securing ink containers (12) corresponding



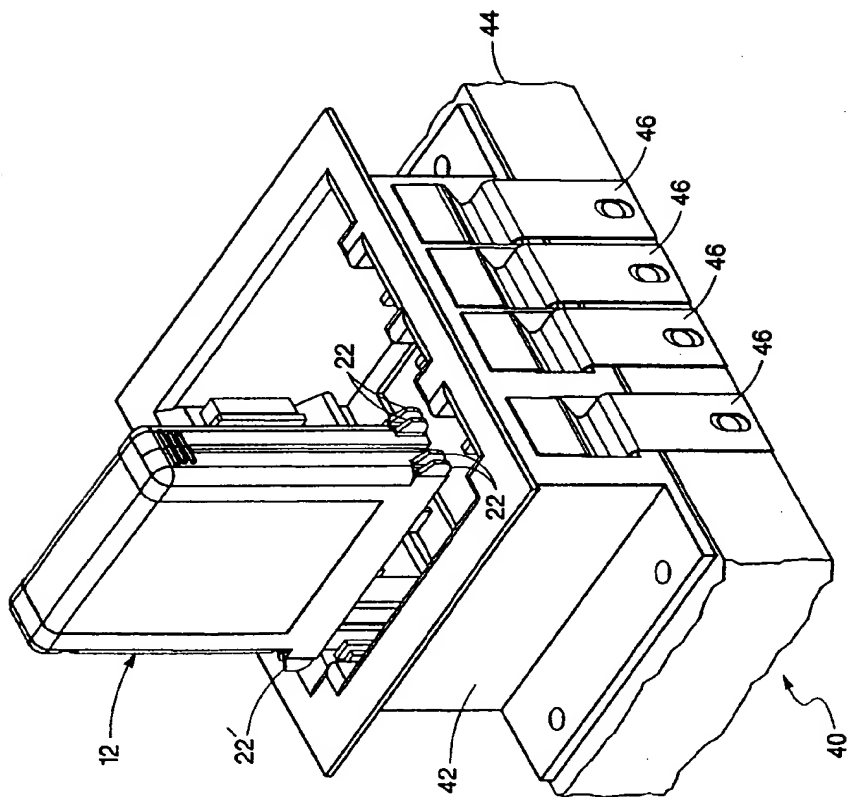


FIG. 2

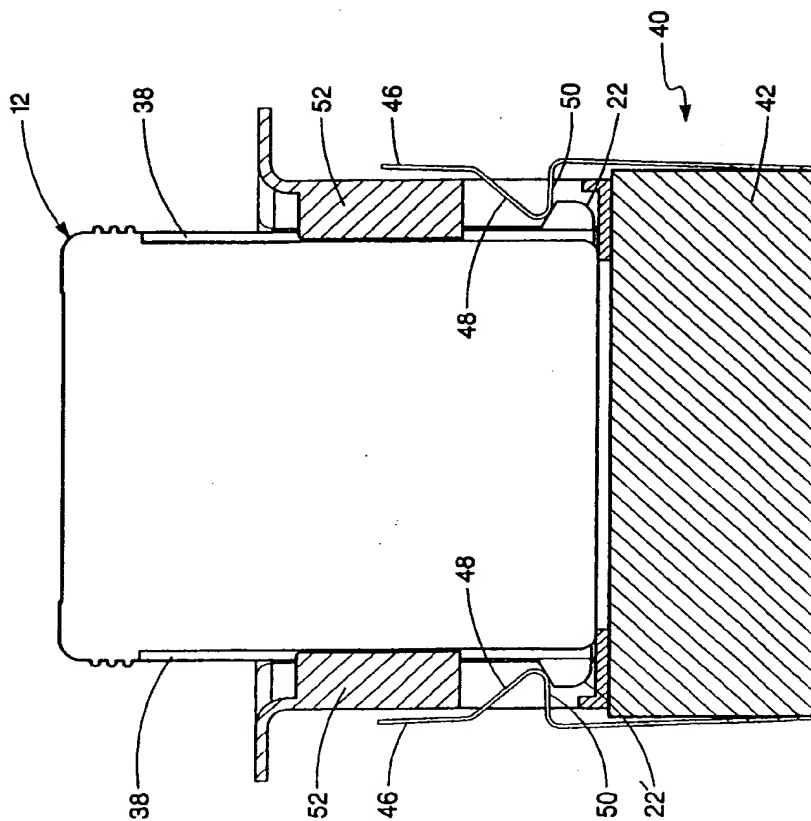


FIG. 3

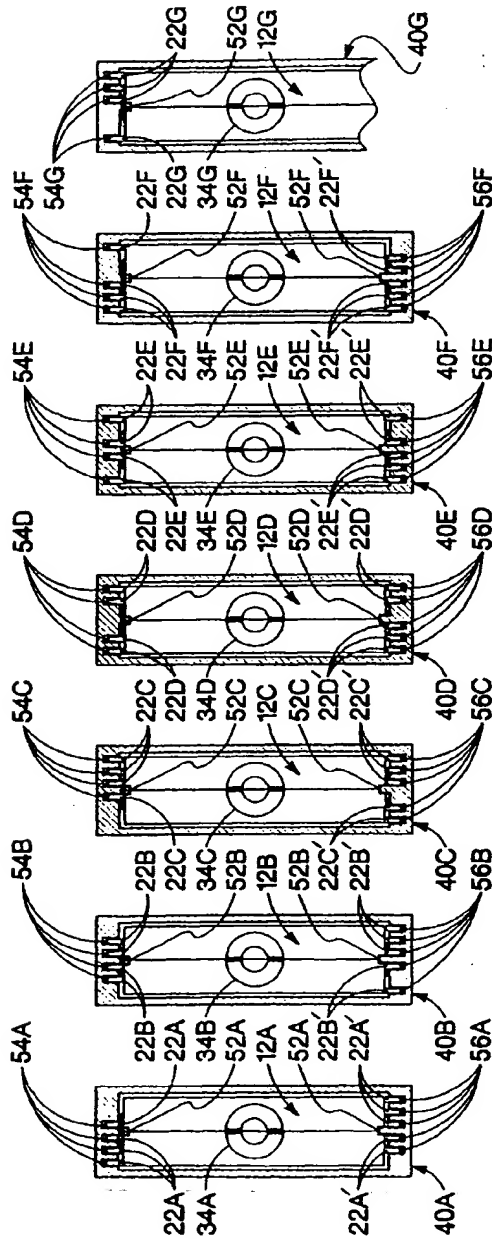


FIG. 4A FIG. 4B FIG. 4C FIG. 4D FIG. 4E FIG. 4F FIG. 4G